

### REMARKS

Applicants have amended Claims 1, 5 and 10 and have added new Claims 12-14. Support for the amendment can be found generally throughout the specification. Applicants respectfully submit that no new matter has been added by the present amendment.

#### I. Claims Statements

The Office Action states that "certain statements" in the claims are "inappropriate." While the Office Action does not reject Claims 1-11 under 35 U.S.C. § 112, Applicants have amended Claims 1-11 to advance prosecution and thereby deleted the phrases "customary additive" and "such as" and "based on MBT."

#### II. Rejection under 35 U.S.C. §103(a).

Claims 1-11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Trivette, Jr. (U.S. Patent No. 3,979,369), DN 122:13570, and DN 120:10211.

Upon information and belief, DN 122: 13570 corresponds to Nordsiek, et al., Kautsch. Gummi Kunstst. (1994), 47(5), 319-27 and DN 120:10211 corresponds to Wolpers, et al. U.S. Patent No. 5,342,900.

Specifically, the Office Action states that Trivette, Jr. discloses a vulcanizing system similar to one in the claimed composition and that although Trivette, Jr. discloses a large list of compounds, the claimed vulcanizing system is suggested, including compound (I) and the appropriate range of sulfur. The Office Action also states that compound (I) is clearly suggested by Trivette, Jr. Further, the Office Action states that DN122 (Nordsiek, et al.) and DN120 (Wolpers, et al.) use a weight of sulfur which is proximate to values disclosed by Applicants, thus it would have been obvious to a skilled person in this art to modify the sulfur amount in small increments because only slight variations in processing safety or in some instances, no variation in processing safety would take place.

Applicants respectfully submit that the rejection under 35 U.S.C. §103(a) is unclear, specifically it is unclear as to whether the rejection is over each reference individually or in some combination thereof. Accordingly, since the Office Action does not indicate a combination of the references by language such as, in view of, Applicants have argued each reference individually.

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Applicants respectfully traverse these grounds of rejection. Amended Claim 1 is directed to a vulcanizable rubber compound based on diene rubbers comprising a vulcanizing system comprising (a) 0.5 to 3.8 parts by weight of compound (I),  $R_2N-(C=S)-S-S-(CH_2)_X-S-S-(C=S)-NR_2$  (I) wherein  $R = (C_6H_5CH_2)$ ; and  $X = 6$ ; (b) 0.5 to 2 parts by weight sulfur; and (c) 0.5 to 3.0 parts by weight of at least one vulcanization accelerator, each per 100 parts by weight of rubber. Claims 2-14 are dependent upon Claim 1 or upon an intervening dependent claim.

"To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (Fed. Cir. 1974)". Applicants also respectfully submit that "in order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claims limitations. The teachings or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicants' disclosure." See MPEP § 2142, citing In re Vaeck, 947 F.2d 488, 20 USPQ 2d. 1438 (Fed. Cir. 1991).

The issue of motivation is properly addressed in terms of one of ordinary skill in the art who has not had access to Applicants' specification. As set forth by the Federal Circuit in In re Dow Chemical, 5 U.S.P.Q.2d 1529 (Fed. Cir. 1988) "the consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success, viewed in the light of the prior art". The proper standard clearly required by the Federal Circuit is that "both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure". The fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient to establish *prima facie* obviousness.

Applicants respectfully submit that neither Trivette, Jr. or Nordsiek, et al. or Wolpers, et al. render the present invention obvious.

a. Rejection over Trivette, Jr.

Applicants respectfully submit that Trivette, Jr. fails to teach or suggest all the claim limitations of the present invention. Further, Applicants submit that Trivette, Jr. fails to motivate one skilled in the art to arrive at a vulcanizable rubber having improved processing safety, improved modulus, improved resistance to tear propagation and excellent resistance with respect to reversion. Applicants respectfully submit that Trivette, Jr. fails to teach or suggest a vulcanizable rubber comprising a vulcanizing system comprising 0.5 to 3.8 parts by weight of NDT, 0.5 to 2.0 parts by weight sulfur and 0.5 to 3.0 parts by weight of at least one vulcanization accelerator.

In the alternative, Trivette, Jr. merely discloses a new crosslinking reaction wherein organic bridging groups are introduced into the cross-link of allylic position. See Abstract. Accordingly, Trivette, Jr. teaches a method of cross linking which comprises incorporating into diene rubber a cross-linking amount of  $(\text{AccS-S}_x)_n\text{R-S}_x\text{-SAcc}$ . See Claim 1. Trivette, Jr. further teaches that the amount of cross-linking agent (i.e. the amount of  $(\text{AccS-S}_x)_n\text{R-S}_x\text{-SAcc}$ ) used may vary from 0.1 to 30 parts per 100 parts rubber. See Column 24, lines 53-58. Then beginning in column 13 and ending in column 24, Trivette, Jr. discloses countless examples of useful crosslinking agents. Despite the assertion of the Office Action, Applicants submit that Trivette, Jr. provides no motivation to one skilled in the art to combine 0.5 to 3.8 parts by weight of NDT (1,6-bis(N,N-dibenzylthiocarbamoyldithio)hexane) with 0.5 to 2.0 parts by weight sulfur and at least one vulcanization accelerator.

Further Applicants submit that, Trivette, Jr. discloses that increased amounts of sulfur (i.e. more than 1.0 parts by weight) cause a deterioration of the processing safety. Compare Stocks 6 and 7 in Table VII and Stock 1 in Table II. Further, Applicants submit that Trivette, Jr. discloses cross-linking agents, in the absence of sulfur or an accelerator, cross-link rubber and produce vulcanizates having satisfactory properties. Trivette, Jr. also discloses that the stocks containing the cross-linking agents have greater processing safety than the stocks containing sulfur and an accelerator. See Column 42, line 32 – Column 43, line 1. Accordingly, Applicants submit that Trivette, Jr. provides no motivation to arrive at a vulcanizable rubber compound based on diene rubbers comprising a vulcanizing system comprising (a) 0.5 to 3.8 parts by weight of compound (I),  $\text{R}_2\text{N}-(\text{C}=\text{S})-\text{S}-\text{S}-(\text{CH}_2)_x-\text{S}-$

S-(C=S)-NR<sub>2</sub> (I) wherein R = (C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>); and X =6, per 100 parts by weight of rubber; (b) 0.5 to 2 parts by weight sulfur, per 100 parts by weight of rubber ; and (c) 0.5 to 3.0 parts by weight of at least one vulcanization accelerator, per 100 parts by weight of rubber.

**b. Rejection over Nordsiek, et al.**

Applicants submit that Nordsiek, et al. also fails to suggest the present invention. Specifically, Applicants respectfully submit that Nordsiek, et al. discloses a rubber vulcanization system using NDT alone or in combination with sulfur. However, Nordsiek, et al. merely teaches using small amounts of sulfur (i.e., up to 0.2 phr). Applicants further submit that despite the assertions of the Office Action, to an ordinary skilled artisan, sulfur loading is not proximate, and 0.2 is far away from the claimed sulfur loading of 0.5 to 2.0 parts by weight. Further, Applicants respectfully submit that Nordsiek, et al. provides no motivation or suggestion to combine 0.5 to 3.8 parts by weight of NDT (1,6-bis(N,N- dibenzylthio-carbamoyldithio)hexane) with 0.5 to 2.0 parts by weight sulfur and at least one vulcanization accelerator. Accordingly, Applicants submit that Nordsiek, et al. does not render the present invention obvious.

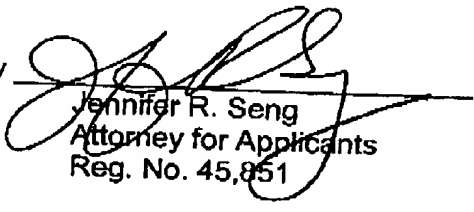
**c. Rejection over Wolpers, et al.**

Similarly, Applicants respectfully submit that Wolpers, et al. discloses a method of producing vulcanized rubber materials with a cross-linking system comprising NDT and 0.05 to 0.3 parts by weight of sulfur. As stated above, the claimed sulfur load of 0.5 is significantly higher than that disclosed in Wolpers, et al. Also Applicants respectfully submit that Wolpers, et al. provides no motivation or suggestion to combine 0.5 to 3.8 parts by weight of NDT (1,6-bis(N,N-dibenzylthio-carbamoyldithio)hexane) with 0.5 to 2.0 parts by weight sulfur and at least one vulcanization accelerator. Accordingly, Applicants submit that Wolpers, et al. does not render the present invention obvious.

For at least these reasons, Applicants respectfully submit that Trivette, Jr., Nordsiek, et al. or Wolpers, et al. fail to suggest the presently claimed invention and accordingly Applicants request withdrawal of these rejections.

Respectfully submitted,

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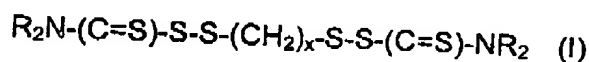
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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims:**

1. (Amended) A vulcanizable rubber compound based on diene rubbers ~~and customary additives~~, comprising a vulcanizing system contained in the compounds comprising

- a) 0.5 to 3.8 parts by weight of compound (I)



wherein R = (C<sub>6</sub>H<sub>5</sub>CH<sub>2</sub>);

and X =6;

- b) 0.5 to 2 parts by weight sulfur; and  
d) 0.5 to 3.0 parts by weight of at least one vulcanization accelerator wherein the parts by weight are given in each case with respect to 100 parts by weight of rubber.

5. (Amended) A vulcanizable rubber compound according to Claim 1, wherein said at least one vulcanization accelerator is selected from the group consisting of mercaptobenzthiazole (MBT), dibenzothiazyl disulphide (MBTS), sulphenamides ~~based on comprising MBT or mixtures thereof~~, such as ~~benzothiazyl-2-cyclohexylsulphenamide (CBS), benzothiazyl-2-dicyclohexylsulphenamide (DCBS), benzothiazyl-2-tert-butylsulphenamide (TBBS) and benzothiazyl-2-sulphenomorpholide (MBS) or mixtures thereof.~~

10. (Amended) Rubber moldings according to Claim 6, wherein said at least one vulcanization accelerator is selected from the group consisting of mercaptobenzthiazole (MBT), dibenzothiazyl disulphide (MBTS), sulphenamides ~~based on comprising MBT or mixtures thereof~~, such as ~~benzothiazyl-2-cyclohexylsulphenamide (CBS), benzothiazyl-2-dicyclohexylsulphenamide (DCBS), benzothiazyl-2-tert-butylsulphenamide (TBBS) and benzothiazyl-2-sulphenomorpholide (MBS) or mixtures thereof.~~

12. (New) The vulcanizable rubber compound according to Claim 1, wherein the compound further comprises a rubber additive(s).

13. (New) The vulcanizable rubber compound according to Claim 5, wherein the sulphenamide comprising MBT is selected from the group consisting of benzothiazyl-2-cyclohexylsulphenamide (CBS), benzothiazyl-2-dicyclohexylsulphenamide (DCBS), benzothiazyl-2-tert.-butylsulphen-amide (TBBS) and benzothiazyl-2-sulphenomorpholide (MBS) or mixtures thereof.

14. (New) The rubber moldings according to Claim 10, wherein the sulphenamide comprising MBT is selected from the group consisting of benzothiazyl-2-cyclohexylsulphenamide (CBS), benzothiazyl-2-dicyclohexylsulphenamide (DCBS), benzothiazyl-2-tert.-butylsulphen-amide (TBBS) and benzothiazyl-2-sulphenomorpholide (MBS) or mixtures thereof.

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